



Product Number

24V20 Ah

Version

A/1

Effective Date

2023/02/26

Page Times

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24V20 Ah

LiFePO4 Battery Specifications (Ordinary Temperatures)

| Approval | Review | Preparation |
|----------|--------|-------------|
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Customer Acknowledgement

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Revision History

| Revised Version | Revision Date | Revision Content |
|-----------------|---------------|------------------|
| A/0 | 2024/03/01 | First Release |
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1 Overview

This specification is applicable to LiFePO4 battery pack.

2 Product Type And Model

2.1 Product type: Lithium iron phosphate battery pack

2.2 Customer product model: 24V20Ah

3 Electrical Parameters

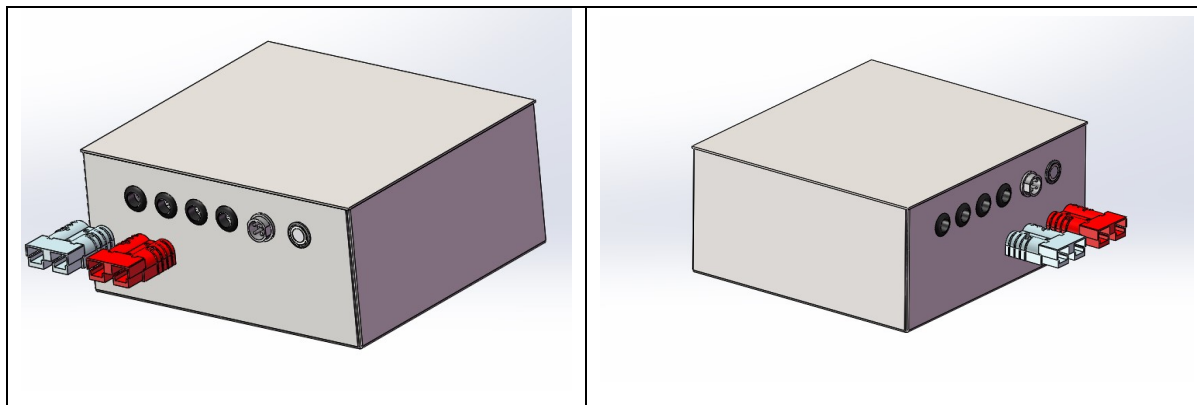
Table 1 Electrical Parameters

| No. | Item | | Standard | Remarks |
|-----|--|-----------|------------|-------------------------------|
| 1 | Nominal Voltage (V) | | 24 | |
| 2 | Nominal Capacity (Ah) | | 20 | @RT 0.5C charge and discharge |
| 4 | Minimum Capacity (Ah) | | 19 | |
| 5 | Charging Cut-off Voltage (V) | | 29.2 | Single String 3.65V |
| 6 | Standard Charging Current (A) | | 10 | |
| 7 | Maximum Continuous Charging Current (A) | | 20 | 0.1C, 0°C~5°C, 80%SOC |
| | | | | 0.5C, 5°C~15°C, 100%SOC |
| | | | | 1C, 15°C~35°C, 100%SOC |
| 8 | Discharge Cut-off Voltage (V) | | 20 | Single String 2.5V |
| 9 | Standard Discharge Current (A) | | 10 | |
| 10 | Maximum Continuous Discharge Current (A) | | 20 | |
| 11 | Operating Temperature (°C) | Charging | 0°C~45°C | |
| | | Discharge | -20°C~50°C | |
| 12 | Internal Resistance(mΩ) | | ≤50 mΩ | |

| No. | Item | Standard | Remarks |
|-----|---------------------|--|--|
| 13 | Dimension (mm) | L220W200H100 | Excluding carrying handle, connector projection size |
| 14 | Weight (kg) | Approx. 5 kg | |
| 15 | Color | CP7733 | Starry Gray |
| 16 | IP Rating | IPX4 | |
| 17 | Communication | RS485 | Baud rate 9600 (JY-001) |
| 18 | Storage Temperature | 0°C~45°C/1 month | @SOC50% |
| | | 0°C~30°C/6months | |
| 19 | Cycle Life | ≥1500 times | @80%DOD |
| 20 | Other Description | Battery SOC power to 35% or single string voltage to 2.9V, the cart must be charged after doing this task to prevent over-discharge hibernation; | |

4 Appearance And Dimensions (In kind, pictures are for reference only)

4.1 Shape



5 Interfaces And Definitions

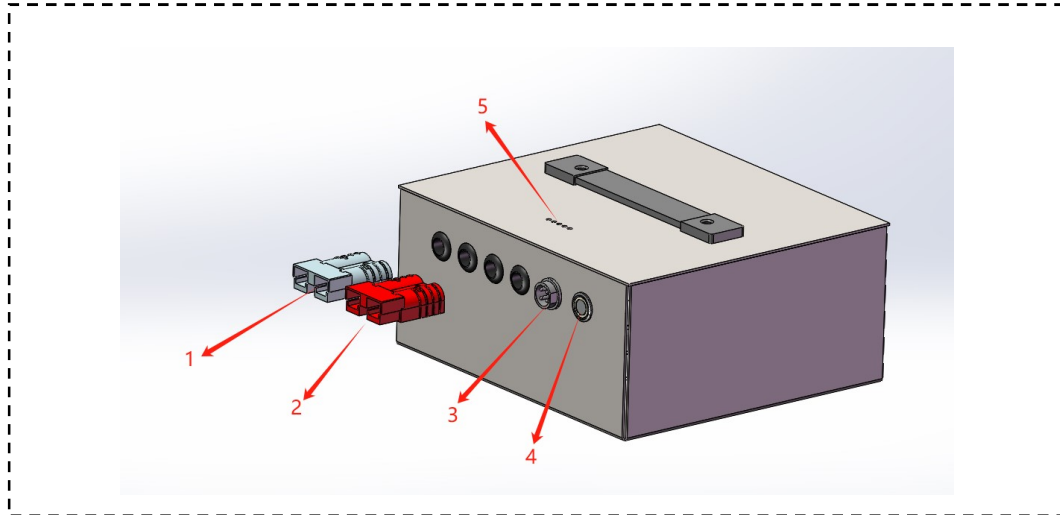
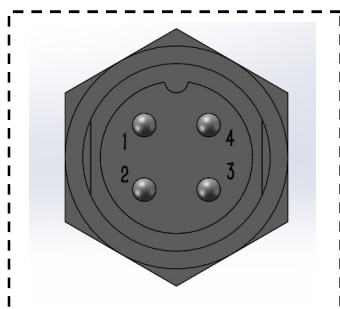


Table 2 Interface Definition

| Interface | Specification | Brand | Remarks |
|--------------------|--------------------------|--------------------|-------------|
| Charging Plug | MPC50A Grey | GRID | Outlet 30cm |
| Discharge Plug | MPC50A Red | GRID | Outlet 30cm |
| Communication Plug | GX16-4 male | Standard component | Fixed |
| Switch | φ16mm self-locking light | Standard component | Fixed |
| Light Borad | LED-PCB | / | |



| Model | Function | Pin | Description |
|-------------|---|-----|--------------------|
| MPC50A Grey | Battery pack charging port, red is positive, black is negative | + | Charging Positive |
| | | - | Charge Negative |
| MPC50A Red | Battery pack discharge port, red is positive, black is negative | + | Discharge positive |
| | | - | Discharge negative |

Table 3 Communication Interface Definition


| Pin | Definition | Definition | Remarks |
|-----|------------|------------|--------------------------|
| 1 | RS485 | RS485-A | Baud rate 9600 |
| 2 | | RS485-B | |
| 3 | Switch | SW+ | Short-circuit power-up |
| 4 | | SW- | Discharge and power down |

6 Electrical Performance

| Project | Test Method | Standard |
|-----------------------|--|---|
| 6.1 Rated Capacity | <p>1. After standard discharge, put the battery pack on open circuit at 25°C±5°C for 5H~10H, then stop the test when charging with 0.5C(A) current to cut-off until the current is less than 0.05C, and calculate the charging capacity (in Ah).</p> <p>2. After standard charging, leave the battery pack open-circuit at 25°C ± 5°C for 5H~10H, then discharge</p> | <p>The charging capacity under different current conditions meets:</p> <p>≥ 95%AH@0.5C</p> <p>Charging capacity under different current conditions meets:</p> <p>≥ 95%AH@0.5C</p> <p>≥ 93%AH@1C</p> |

| Project | Test Method | Standard |
|--|---|---|
| | it at 0.5C(A) current to the cut-off voltage of 2.5V to stop the test, and then calculate the discharging capacity (in terms of Ah). | Temperature setting should not exceed $\pm 2^{\circ}\text{C}$. |
| 6.2 High Temperature Capacity | <p>1. At room temperature, continuously charge the battery with 0.5C(A) constant current until the battery voltage is 3.65V, and then continuously charge the battery with constant voltage at 3.65V until the current lower limit value is $\leq 1\text{A}$.</p> <p>2. After standard charging, put the battery pack open circuit in high temperature box and set the temperature 40°C, set aside 300min after preset temperature stabilization; then 0.5C (A) constant current discharge to the cut-off voltage 2.5V, calculate the discharge capacity.</p> | <p>The rate of satisfying the electric capacity under different temperature: $\geq 95\%$ of rated capacity @ 40°C</p> <p>The temperature setting should not exceed $\pm 2^{\circ}\text{C}$.</p> |
| 6.3 Low Temperature Capacity | <p>1. At room temperature, charge the battery with 0.5C(A) constant current continuously until the battery voltage is 3.65V, and then charge it continuously with constant voltage at 3.65V until the current lower limit value $\leq 1\text{A}$.</p> <p>2. After standard charging, open circuit in the cryostat and set the temperature, preset temperature stability and set aside 480min;</p> <p>3. 0.2C (A) constant current discharge to the discharge cut-off voltage, calculate the discharge capacity.</p> | <p>Charge and discharge capacity satisfaction rate at different temperatures: $\geq 90\%$ rated capacity @ 0°C; $\geq 80\%$ rated capacity @ -20°C; Temperature setting should not exceed $\pm 2^{\circ}\text{C}$;</p> |
| Cycle Life | <p>Test conditions:</p> <p>Charge: 0.5C charge to a current of less than 0.05C</p> <p>Discharge: 0.5C discharge to the cut-off voltage of 2.5V</p> <p>When the discharge capacity is reduced to 80% of the initial capacity, the number of cycles completed is defined as the cycle life of the battery pack.</p> | ≥ 1500 @80%DOD |

7 Mechanical Properties

| Project | Test Method And Conditions | Standard |
|----------------|---|-----------------------|
| Vibration Test | The standard charged battery cell was fixed on the vibration table and vibrated along X, Y and Z directions for 30 minutes each with an amplitude of 1.6 mm and a vibration frequency of 10Hz~55Hz with a variation of 1Hz per minute. | No fire, no explosion |
| Drop Test | The standard charged cores were dropped from 1 meter height to concrete floor twice. | No fire, no explosion |
| Pinprick Test | After standard charging, the battery connected with thermocouple is put into the ventilation kitchen, and a high temperature resistant steel needle of $\phi 3\text{mm} \sim \phi 8\text{mm}$ is used to penetrate from the direction perpendicular to the battery pole plate with a speed of 10mm/s~40mm/s (the steel needle stays in the battery) | No fire, no explosion |
| Crush Test | After standard charging, squeeze the battery in the direction perpendicular to the battery pole plate until the battery shell ruptures or internal short circuit (the battery voltage becomes 0V), the squeezing head area is not less than 20cm ² . | No fire, no explosion |

8 Safety Performance

| Item | Test Method And Conditions | Standard |
|------------------------|---|---|
| Overcharge Performance | The cell is discharged to 2.5V at 0.5C, then charged to 3.65V at 1C, and charged at constant voltage until the current drops to 0.02C to terminate, or the total charging time reaches 8 hours. | No fire, no explosion Maximum temperature $\leq 150^{\circ}\text{C}$ |
| | | |

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|----------------------------|---|---|
| Over-discharge Performance | After standard charging, discharge at $(25 \pm 2) ^\circ\text{C}$ with standard discharge current until the battery voltage reaches 0V to end the test. | No fire, no explosion |
| Short Circuit Performance | After standard charging of the cells, the cells are left at $25 \pm 2^\circ\text{C}$ for 30 minutes. Connect the positive and negative terminals with 1.5 mm ² copper wire (resistance $\leq 50 \text{ m}\Omega$) and disconnect only after 1 hour. | No fire, no explosion Maximum temperature $\leq 150^\circ\text{C}$ |
| Hot Box Characteristics | After standard charging of the cell, put it into baking and heat it up. The temperature of the oven should rise at a rate of $5 \pm 2^\circ\text{C}/\text{min}$ and keep it for 10 min when the temperature rises to $130 \pm 2^\circ\text{C}$. | No fire, no explosion Maximum temperature $\leq 130^\circ\text{C}$ |

9 Precautions

9.1 Using Battery:

9.1.1 Please observe the following safety terms when using the battery. Misuse of the battery can cause serious injury by overheating, dropsy, and fire.

※Do not put the battery into the fire or heat the battery.

※Do not reverse the polarity of the battery by reversing it.

※Do not use metal objects (e.g. wires) or conductive materials (e.g. carbon rods) to connect the positive and negative terminals of the battery

※Do not carry or place the battery with necklaces, hairpins or other metal objects

※Do not use hard objects (such as nails) to pierce the battery, hammer the battery, step on the battery, or strongly bump or shake the battery.

※Do not put the battery into water or other solvents, and do not leave the battery in a particularly humid environment for a long time.

9.1.2 Do not disassemble or modify the battery. There is a protection device inside the battery, if damaged it will make the battery become hot, dropsy or fire during use.

9.1.3 Do not place the battery near a fire, stove, or other hot object. Do not expose the battery to strong sunlight.

9.1.4 Children should use the battery under adult supervision to ensure that the battery is being used correctly according to the instruction manual.



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9.1.5 When the battery is disposed of, it should be sent to a special place for recycling.

9.1.6 When using the battery, charging the battery or placing the battery, if the battery has abnormal phenomena such as odor, severe heat, dropsy, discoloration or deformation, please stop using it immediately. Contact your local dealer when something like this happens.

9.1.7 Do not put the battery into microwave oven, high pressure container or induction stove.

9.1.8 In case the liquid from the battery leaks into your eyes, please do not rub your eyes, flush with water and go to the hospital immediately to avoid any damage to your eyes.

9.2 Charging:

9.2.1 Charging Current

The charging current should not exceed the maximum charging current specified in this standard book. Charging with a current higher than the recommended value will likely cause problems with the charging and discharging performance, mechanical performance and safety performance of the battery core, and may result in heat generation or leakage.

9.2.2 Charging Voltage

The charging voltage shall not exceed the charging cut-off voltage specified in this standard book, and the charger shall be designed to meet this condition. Battery pack voltage higher than the charging cut-off voltage value will likely cause problems with the charging and discharging performance, mechanical performance and safety performance of the battery pack, and may result in heat or leakage.

9.2.3 Charging Temperature

The battery pack is charged within the ambient temperature range of 0°C~45°C.

9.2.4 Prohibit Reverse Charging

Correctly connect the positive and negative terminals of the battery, and reverse charging is strictly prohibited. If the positive and negative terminals of the battery are connected in reverse, it will not be able to charge the battery cell. At the same time, reverse charging will reduce the charging and discharging performance and safety of the battery cell, and will lead to heat and leakage.

9.3 Discharging:

9.3.1 Discharge Current



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The discharge current shall not exceed the maximum discharge current specified in this standard, and the high current discharge will lead to a drastic reduction of the core capacity and overheating.

9.3.2 Discharge Temperature

The battery pack is recommended to be discharged in the ambient temperature range of -10°C~55°C.

9.3.3 Over-discharge

It should be noted that during a long period of time when the cell is not in use, it may be in some kind of over-discharge with other self-discharge characteristics. To prevent discharge from occurring, the cell should be charged periodically to maintain its voltage between 3.1V and 3.3V. Over-discharge can lead to the loss of cell performance, and battery function.

10 Battery Pack Transportation And Storage

10.1 Transportation

The battery pack should be protected from severe vibration, shock or extrusion and from sun and rain during transportation.

10.2 Storage

The battery pack should be stored in a clean, dry and ventilated room with ambient temperature of -20°C~45°C and relative humidity $\leq 75\%$, avoid contact with corrosive substances, and keep away from heat and fire sources.

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Attachment 1 "24V20Ah Dimensional Drawing"

